

ZOOLOGY.—*The systematic position of Indostomus paradoxus Prashad and Mukerji, a fresh water fish from Burma.*<sup>1</sup> ROLF L. BOLIN, Hopkins Marine Station of Stanford University. (Communicated by WALDO L. SCHMITT.)

The interrelationships between the sticklebacks, tubemouths, pipe-fishes, and their relatives have long mystified systematists. The families have been shuffled and reshuffled by Starks,<sup>2</sup> Regan,<sup>3</sup> Jungersen,<sup>4</sup> Gregory,<sup>5</sup> and others into various groups, orders, suborders, and superfamilies in an effort to express their evolutionary history. In spite of careful and painstaking research, the problem still remains unsettled and the natural system obscure. The most doubtful point is the question of whether the Gasterosteoidae (including the families Gasterosteidae and Aulorhynchidae) show affinity to the Scleroparei or to the Hemibranchii and Lophobranchii.

The Indostomidae of Prashad and Mukerji,<sup>6</sup> based upon their new species, *Indostomus paradoxus*, from Indawgyi Lake, Myitkyina District, Upper Burma, is the most recently described family to be allocated to this systematic complex. Although of extreme interest as a possible indicator of the mutual relationships of the other families of the group, it has as yet been discussed only by its authors who state, "This new family is closely allied to the family Solenostomidae and to a certain extent to the Syngnathidae of the order Solenichthys Regan, but differs from either in several important characters."

Through the courtesy of Dr. G. S. Myers of the United States National Museum, I have been able to examine a cotype of *Indostomus paradoxus*. It displays many interesting features and I am convinced that Prashad and Mukerji erred in considering it closely related to the Solenostomidae and Syngnathidae. If we analyze the characters used by these authors to define the family Indostomidae and to differentiate it from its relatives, it appears that the family's affinities are to be sought in more primitive groups than those suggested.

The general body form, although possibly of minor significance, more closely approximates that of the Aulorhynchidae than it does that of any of the other families, certainly far more closely than it approximates that of the Solenostomidae or Syngnathidae. The de-

<sup>1</sup> Received September 5, 1936.

<sup>2</sup> STARKS, E. C. Proc. U. S. Nat. Mus. 25: 623-625. 1902.

<sup>3</sup> REGAN, C. T. Biologia Centralia Americana: x-xi. 1908.

<sup>4</sup> JUNGENSEN, H. F. E. Kgl. Dansk Vidensk. Selsk. Skrift. (7) Naturv. & Math. 8: 329-334. 1910.

<sup>5</sup> GREGORY, W. K. Trans. Amer. Philos. Soc., N.S. 23: 228-229. 1933.

<sup>6</sup> PRASHAD, B. and D. D. MUKERJI, Rec. Indian Mus. 31: 219-220. 1929.

pressed head and caudal region of the Aulorhynchidae are very suggestive of *Indostomus*, the main proportional differences, though of minor significance, being the slightly greater depression and more robust build of the thoracico-abdominal region of *Indostomus*. It should also be noted that, except for the greater caudal attenuation and the depressed instead of compressed body, *Indostomus* rather closely approximates the hemibranchiate family Aulostomidae.

When the fins are considered, we find the same relationships suggested. *Indostomus* has two dorsal fins, the first one composed of short spines unconnected by membrane, the second having its origin immediately behind the last dorsal spine. This condition is duplicated in the Aulorhynchidae and the Aulostomidae and is far different from the two complete and widely separated dorsals of the Solenostomidae and the single dorsal of the Syngnathidae. The anal fin of *Indostomus* differs from that of the Aulorhynchidae only in lacking a small spine at its anterior end, and from that of the Aulostomidae only in having its rays branched instead of simple. The latter difference also characterizes the second dorsal of these forms.

The pectorals and pelvics of *Indostomus* are similar in size and position to those of the Aulorhynchidae. From the Aulostomidae, *Indostomus* differs in having its pelvics in a more anterior position. This difference appears to be of relatively minor importance when compared to the marked differences existing between the normal pelvics of *Indostomus* and the inordinately enlarged fins of the Solenostomidae or the totally absent fins of the Syngnathidae. Further, the pelvics of *Indostomus* are composed of four rays, not one spine and three rays as stated in the original description, the outer ray being enlarged and unbranched, but jointed. This is the condition found in the Aulostomidae and differs from that found in the Aulorhynchidae as well as the Solenostomidae. The two latter families have a well developed spine in the pelvic fin.

The armature of the body in *Indostomus* is very similar to that of the Syngnathidae and, in all probability, strongly influenced Prasad and Mukerji to consider it a close relative of the pipefishes. It must be remembered, however, that such armature has been developed in many widely separated families. We find it in the Loricariidae, the Ostraciidae, and the Agonidae, and while the importance of the bony scutes should not be minimized, neither should their importance be unduly stressed because of the conspicuous nature of the character. Its significance as an indicator of close relationship in the case under discussion is somewhat diminished by the contradictory evidence of

the body form and is much overshadowed by the evidence of the fins. Finally, the Aulorhynchidae are also equipped with bony scutes, although they are deeply imbedded and restricted to narrow median and lateral bands.

Prashad and Mukerji state that *Indostomus* is without teeth. A careful examination of the cotype reveals moderately broad bands of minute, villiform teeth on the premaxillary and dentaries, another feature in which the species in question is similar to both the Aulorhynchidae and Aulostomidae and one in which it differs from the Solenostomidae and Syngnathidae.

The nostrils of *Indostomus* I find to be single on each side, appearing as an elongated slit. This is clearly shown in Prashad and Mukerji's excellent figures, although they state that there are two nasal openings and indicate in their table that these are similar to the double nostrils of the Syngnathidae. The single opening is somewhat more extensive than that of the Aulorhynchidae and is clearly different from the double openings of the Aulostomidae and Syngnathidae, but is hardly to be compared to the open nasal organ of the Solenostomidae.

The Indostomidae are said to have "four complete lobate gills." The Syngnathidae, however, of all the fish which I have been able to examine, are the only ones in which the gills are so sharply modified in form and structure that they deserve the special designation lobate. The gills of the Solenostomidae, although equipped with comparatively few filaments, represent only one extreme in a very wide but even numerical variation, and do not differ in basic form from the gills of other teleosts. In the number and shape of the filaments *Indostomus* is intermediate between the Aulorhynchidae and the Aulostomidae on the one hand and the Solenostomidae on the other.

The lateral line system of *Indostomus* is much reduced. Small pores in the interorbital space, behind the eye, on the occiput, and just anterior to the upper end of the gill opening indicate that the supra-orbital, infraorbital and supratemporal canals are present. This condition is similar to that found in the Centriscidae, and is intermediate between that of the Aulorhynchidae and the Aulostomidae with their well developed lateral line systems and that found in the Solenostomidae and Syngnathidae without any lateral line system at all.

The final analysis of the relationships of *Indostomus* must depend upon osteological investigations. Unfortunately, the species is so small (the only available specimen is 26 mm in standard length) that osteological investigation of such diagnostic characters as the pres-

ence or absence of some of the pterygoid or branchial elements is impossible without macerating. This I have been unable to do, as the cotype which I have examined is apparently the only specimen of the species in this country and is too valuable to destroy.

Of the known osteological characters, the sutural connection of the post-temporal with the cranium is indicative of relationship to the Hemibranchii and Lophobranchii. On the other hand, the fact noted by Prashad and Mukerji that none of the anterior vertebrae are fused indicates that *Indostomus* is not closely related to these groups, but belongs instead with or near the Gasterosteoidea.

The branchiostegals are 5 in number on the cotype, not 6 as recorded in the type description. This number closely approximates that found in the Aulorhynchidae, 4; equals that found in some of the Aulostomidae, 4-5; and is markedly different from the much reduced number found in the Solenostomidae, 1; and also the Syngnathidae, 1-3.

From the available evidence it seems that the Indostomidae can claim no very close relationship to any known family. The only character tending to link it to the Lophobranchii is the nature of the armature. The majority of characters, the body form, fins, teeth, lateral line system, anterior vertebrae and branchiostegals, indicate that its relatives should be sought among the Gasterosteoidea or Hemibranchii. Of the families comprising these two groups, the Aulorhynchidae and Aulostomidae are by far most similar to the Indostomidae. The latter family appears in many respects to occupy an intermediate position and serves as additional evidence of the relationship of the Gasterosteoidea to the Hemibranchii. While this relationship may not be close enough definitely to validate the questionable order Thoracostei, it is much closer than the relationship of the Gasterosteoidea to the Scleroparei which was suggested by Jungersen.

ENTOMOLOGY.—*A redistribution of Monoxia puncticollis and allied species.*<sup>1</sup> DORIS H. BLAKE. (Communicated by AUSTIN H. CLARK.)

LeConte, in his treatment of *Galeruca* in 1865, divided the genus into five groups, the fifth group consisting of two species, *G. maritima* and *G. morosa*, both described by him. In 1885 he added a third species, *G. erosa*. These three species have been synonymized by Horn with *Monoxia puncticollis* (Say). LeConte had never been able to

<sup>1</sup> Received May 22, 1936.